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# IMPACT OF MATERNAL ANEMIA ON PERINATAL OUTCOME

**Farhana Yousaf, Gulfareen Haider, Raheela Bilal Shaikh, Ambreen Haider, Nasirudin Muhammad**

Liaquat University Hospital Hyderabad, Isra University Hospital Hyderabad, combined Military Hospital Quetta

## ABSTRACT

***Objective:*** To evaluate the effect of maternal anemia on perinatal outcome.

**Design:** Cohort study

***Place and Duration of Study:*** Department of Obstetrics and Gynecology, Liaquat University Hospital Sindh Pakistan from March 2007 to December 2007.

***Patients and Methods:*** A total number of 1012 women were delivered during the study period. All singleton pregnant women who attended the out patient department before 18 weeks of gestation were included while women with multiple pregnancies, past history of preterm delivery and medical illness except anemia were excluded from the study. Relative risk and a 95% confidence interval were calculated through. Demographic and socioeconomic features of both groups were compared by Chi-Squared test using SPSS 17. A *p*-value of or less than 0.05 was considered as significant.

***Results:*** A total of 818 women fulfilled the inclusion criteria, 407 in anemia group and 411 in non-anemic group. Hemoglobin range of anemic group was from 5 to 10 gram/dl. While in non anemic group hemoglobin ranges from 11 to 13gram/dl (mean11.87±0.54).

Risk of premature birth and low birth weight among anemic women was 3.92 & 2.2 times more than nonanemic women, which was statistically significant. Risk of IUGR was 2.2 times greater in anemia than non-anemic group. However this was statistically significant.

***Conclusion:*** Our study shows that risk of preterm delivery and low birth weight were greater in anemic group than non anemic group, which was statistically significant. Preconceptional evaluation along with planned pregnancy is important in decreasing the frequency of maternal anemia and its effect on fetus and newborn.

**Keywords:** Anemia, low birth weight, perinatal outcome, preterm birth.

## INTRODUCTION

The WHO definition for diagnosis of anemia in pregnancy is a hemoglobin concentration of less than 11 gm/dl and a hematocrit of less than 0.33. Centers for Disease Control, USA proposes a cut off value of 10.5 gm/dl in the second trimester[1]. Anemia is the commonest medical disorder in pregnancy and has a varied prevalence, etiology and degree of severity in different population, being more common in non- industrialized countries.

Maternal anemia is important and is a common problem in pregnancy in developing countries like Pakistan. It is estimated that 1.20 million people are anemic globally[2]. Maternal anemia in pregnancy is commonly considered as risk factor for poor pregnancy outcome and can threaten the life of mother and fetus[3]. However, the extent to which the maternal hemoglobin concentration affects the fetal outcome is still uncertain. Some studies have shown a strong association between low hemoglobin level before delivery and an adverse outcome[4], while other studies have not found a significant association[5]. Thus the purpose of own study was to evaluate the effects of maternal anemia on perinatal outcome.

**Correspondence:** Dr Farhana Yousaf, Flat No. 3, Firous Plaza, Tilik Incline, Hyderabad

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## PATIENTS AND METHODS

This cohort study was conducted in Obstetric and Gynecology Unit of Liaquat University Hospital Hyderabad Sindh Pakistan, from March 2007 to December 2007. A total of 1012 women were delivered during the study period. We included all the women who attended the outpatient clinic before 18 week of gestation, ages 18 or above, and having singleton pregnancy. Women with multiple pregnancies, past history of preterm delivery, obstetric complications or medical illness except anemia, were excluded from the study.

Anemia was defined according to WHO criteria i.e. a hemoglobin <11gm/dl on two occasions during pregnancy and labour. Hemoglobin levels were measured at booking visit, at 28-32 week, at 33-37 week and in labour. Women who had hemoglobin level less than 11g/dl were given oral iron and those with hemoglobin level less than 7 g/dl in third trimester were given either blood transfusion or intravenous iron therapy. All the information regarding gestational age at delivery, fetal outcome in terms of weight and Apgar score was recorded on a predesigned questionnaire. Relative risk and a 95% confidence interval were calculated through medical statistical software. Demographic and socioeconomic features of both groups were compared by Chi-squared test using SPSS 17. A *p*-value of less than 0.05 was considered as significant.

## RESULTS

A total of 818 women fulfilled the inclusion criteria, 407 in anemic group and 411 in no anemic group. Mean age of the women in anemic group was 26.85±4.77 and 27.08±4.65 in non-anemic group (Table 1).

Hemoglobin range of anemic group was from 5 to 10 gram/dl (mean7.6708±1.09846). While in non anemic group hemoglobin ranges from 11 to 13gram/dl (mean11.8686±0.53853).

Risk of preterm delivery (< 37 weeks) was 3.9 times greater among the anemic women than non-anemic, which was statistically significant (95% CI 2.6-5.9, $p<0.0001$). Risk of low birth weight was 2.2 times greater in anemic group with a statistically significant association (95% CI: 1.4-3.5, $p<0.0007$) (Table 2). Risk of IUGR was 2.2 times greater in anemic group (95% CI: 1.3- 3.5, $p=0.0008$) (Table2). Risk of Perinatal mortality was 3 times greater in anemic group but this was not statistically significant (95% CI: 0.8 –11.1, $p=0.0946$) (Table 2). The risk of apgar score at 1 minute in the anemic women was 2.0 times (95% CI: 1.2–3.3, $p=0.00079$) greater than the non-anemic women, and the results were significant statistically (Table 2) The anemic women were also at a 2.6 times greater risk of IUD than non anemic group but the results were not significant Statistically (95% CI:0.7–10.0, $p=0.1413$) (Table 2)

## DISCUSSION

Anemia associated with pregnancy is a possible health problem. The WHO gives anemia prevalence picture at global level at 55.9% among the expectant mothers[6]. It increases the perinatal mortality and morbidity rates consequent to preterm deliveries, IUGR, low birth weight, low apgar score, low iron stores and cognitive and affective dysfunction in the infant[7].

In the developing world, current strategies, to prevent and correct anemia and iron deficiency in pregnant women have met with little success[8]. Two large studies in the industrial world, involving over one million pregnancies clearly indicated that favorable pregnancy outcomes are less frequent among anemic mothers [9, 10].

Our study showed association of maternal anemia in pregnancy with increased risk of delivery of premature and low birth weight babies. Research has been conducted to understand how anemia may predispose to preterm labour either directly or indirectly due to increased risk of infection. The direct effect is related to increased synthesis of corticotrophin releasing hormone as a result of tissue hypoxia[11]. The raised levels can induce maternal and fetal stress[12] and thus produce a risk for preterm labour, PIH and PROM.

Maternal infections during pregnancy are a well known risk factor for preterm labour and the examination of amniotic fluid or placental membranes has shown the presence of bacteria or inflammatory cytokines[13]. The relationship between anemia and infection may be due to adverse effects of anemia on immune function as a result of alterations in the proliferation of T and B-lymphocytes thus reducing the killing activity of phagocytes and neutrophils, and lowering the bactericidal and natural killer cell activity[14]. Lymphocyte stimulation indices have been found to be lower in anemic women[15].

In our study IUGR, perinatal mortality, low apgar score at 1 minute were higher in

**Table-1: Demographic and socioeconomic features of the anemic and non-anemic women**

| Variables | Anemic (n=407) No. | % | Non- Anemic (n=411) No. | % | p-value |
|---|---|---|---|---|---|
| **Age (years)** Mean (SD) | 26.85 | 4.77 | 27.08 | (4.65) | 0.06 |
| **Maternal Education** | | | | | |
| Uneducated | 355 | 87.22 | 359 | 87.34 | 0.07 |
| Primary Education | 42 | 10.3 | 49 | 11.92 | 0.06 |
| Secondary Education | 10 | 2.45 | 3 | 0.72 | 0.04 |
| **Employment status** | | | | | |
| Employed | 28 | 6.87 | 36 | 8.75 | 0.06 |
| House Wife | 379 | 93.12 | 375 | 91.24 | 0.07 |
| **Family Structure** | | | | | |
| Extended | 337 | 82.80 | 344 | 83.69 | 0.08 |
| Nuclear | 70 | 17.19 | 67 | 16.30 | 0.08 |
| **Social Class** | | | | | |
| Poor | 290 | 71.25 | 261 | 63.50 | 0.07 |
| Middle Class | 117 | 28.74 | 150 | 36.49 | 0.06 |

**Table-2: Perinatal outcome**

| Variable | Anemic (n=407) | Non-anemic (n=411) | Relative Risk | 95% Cl | Z statistic | P Value |
|---|---|---|---|---|---|---|
| **Premature birth** | | | | | | |
| Yes | 101 | 26 | 3.92 | 2.6 - 5.9 | 6.5 | P<0.0001 |
| No | 306 | 385 | | | | |
| **Low birth weight** | | | | | | |
| Yes | 53 | 24 | 2.2 | 1.4 – 3.5 | 3.4 | P <0.0007 |
| No | 354 | 387 | | | | |
| **IUGR** | | | | | | |
| Yes | 51 | 23 | 2.2 | 1.3 – 3.5 | 3.3 | P = 0.0008 |
| No | 356 | 388 | | | | |
| **Perinatal Mortality** | | | | | | |
| Yes | 9 | 3 | 3.0 | 0.8– 11.1 | 1.6 | P= 0.0946 |
| No | 398 | 408 | | | | |
| **Low Apgar at 1 min** | | | | | | |
| Yes | 40 | 20 | 2.0 | 1.2 – 3.3 | 2.6 | P= 0.0079 |
| No | 367 | 391 | | | | |
| **Low Apgar at 5 min** | | | | | | |
| Yes | 35 | 22 | 1.6 | 0.9 – 2.6 | 1.8 | P= 0.0714 |
| No | 372 | 389 | | | | |
| **Intrauterine fetal death** | | | | | | |
| Yes | 8 | 3 | 2.6 | 0.7 – 10.0 | 1.4 | P= 0.1413 |
| No | 399 | 408 | | | | |

anemic group than the normal group and the results were statistically significant.

Same was seen in study conducted by Lone et al. whose results show that low apgar score was 1.8 times and intrauterine fetal death was 3.7 times more common in anemic pregnant women compared to non anemic[16]. In another study, Levy et al in their retrospective study, evaluated the preterm birth and birth weights of the anemic pregnant women and determined the maternal anemia as an independent risk factor for preterm birth and found no association with bad perinatal outcome in their study[17]. Bondvik, et al in their case control study on 1400 pregnant women used the first antenatal visit hematocrit levels at parameter, and concluded that low birth weights and preterm rates were significantly higher when maternal hematocrit was under 24%[18].

A U-shaped association is found between maternal hemoglobin and prenatal mortality,

but the data to establish this association are insufficient[19]. It is estimated that 7.3 million perinatal deaths occur annually in the world[20] and by correcting anemia; many of these can be prevented. Their study showed an association of maternal anemia with preterm delivering and low birth weight.

In our study, low birth weight was seen more in anemic group than in non anemic group. Same has been seen in a study conducted by Malhothra[21], whose results show that severe anemia increased the risk of low birth weight.

## CONCLUSION

Our study shows that the risk of preterm delivery and low birth weight were greater in anemic group than non anemic group, which was statistically significant. Preconceptional evaluation along with a planned pregnancy is important in decreasing the frequency of maternal anemia and its affects on fetus and newborn.

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